EXHIBIT 1

EIGHTH DECLARATION OF PAUL ENRIQUEZ

IN THE UNITED STATES DISTRICT COURT
FOR THE SOUTHERN DISTRICT OF TEXAS
MCALLEN DIVISION

THE GENERAL LAND OFFICE OF THE STATE OF TEXAS, *et al.*, Plaintiffs, v. JOSEPH R. BIDEN JR., in his official capacity as President of the United States, *et al.*, Defendants	No. 7:21-cv-00272
THE STATE OF MISSOURI; THE STATE OF TEXAS, Plaintiffs, v. JOSEPH R. BIDEN JR., in his official capacity as President of the United States, *et al.*, Defendants.	No. 7:21-cv-00420 (formerly No. 6:21-cv-00052) Hon. Drew B. Tipton

EIGHTH DECLARATION OF PAUL ENRIQUEZ

I, Paul Enriquez, declare as follows:

1. I am the Director, Infrastructure Portfolio, U.S. Border Patrol Program Management Office Directorate ("PMOD"), U.S. Customs and Border Protection ("CBP"), an agency of the Department of Homeland Security ("DHS"). I have held this position since January 2023 and support the planning and execution of border infrastructure projects from construction to

maintenance. From May 2021 to December 2022, I served as the Deputy Director for the Infrastructure Portfolio and from August 2018 to May 2021, I served as the Real Estate and Environmental Director for the Infrastructure Portfolio. From 2013 to August 2018, I was the Real Estate and Environmental Branch Chief for the Border Patrol and Air and Marine Program Management Office ("BPAM"), Facilities Management and Engineering, Office of Facilities and Asset Management. From 2011 to 2013, I was employed as an Environmental Protection Specialist in the BPAM office. In that role, I performed environmental analyses for various border infrastructure projects. From 2008 to 2011, I was a contractor assigned to the BPAM office and provided environmental support on various border infrastructure projects.

2. CBP is the DHS component with primary responsibility for border security. CBP constructs, operates, and maintains border infrastructure necessary to deter and prevent illegal entry on the southern border.

3. Within CBP, PMOD has expertise in managing and executing border infrastructure projects. PMOD is tasked with managing the schedule, finances, real estate acquisition, environmental planning, and construction of the border infrastructure system along the U.S. border.

4. Based upon my current and past job duties, I am familiar with the funding appropriated to CBP for barrier construction, the obligations and projects associated with such funding, and the process by which new barrier infrastructure is constructed.

5. I previously submitted declarations on December 8, 2021, July 12, 2022, August 18, 2023, September 27, 2023, October 17, 2023, March 14, 2024, and March 21, 2024 that outlined, among other things, how CBP was using the appropriated funds it received in fiscal years ("FY") 2020 and 2021 for barrier system and the steps CBP is taking to comply with the Court's order of March

8, 2024.

6. This declaration is based on my personal knowledge and information made available to me in the course of my official duties.

BACKGROUND

7. On March 8, 2024, the Court issued an order stating that CBP's FY20 and FY21 barrier system appropriations may only be used for the "construction of physical barriers, such as walls, fencing, buoys, etc." The court's order prohibits "the Government and all its respective officers, agents, servants, employees, attorneys, and other persons who are in active concert or participation with them" from obligating FY20 or FY21 barrier system funds "toward mitigation and remediation efforts, repair of existing barrier, so-called system attribute installation at existing sites, or other similar purposes."

8. On March 21, 2024, I submitted a declaration in support of the federal government's motion to clarify the Court's injunction. *See* ECF No. 133-1. Among other things, paragraph 15 my declaration explained the importance of drainage and erosion control measures when building new border barriers:

> Erosion and drainage control measures are a critical element of barrier construction. If CBP does not ensure design and construction of the barrier includes proper drainage and long term erosion control measures in and around constructed barrier, the integrity and stability of the barrier will be at risk due to undermining of the foundation of the barrier by heavy water flows during storm events which are common occurrences in the southwest border regions. Improper erosion or drainage control also substantially increase the long-term maintenance costs of the barrier.

9. During a hearing on March 24, 2024, I understand the Court issued an oral ruling denying the federal government's request to clarify that drainage and erosion costs could be funded by the FY20 and FY21 barrier system appropriations. I also understand that the Court entered a Final

Judgment and a Permanent Injunction on May 29, 2024, that mirrored the preliminary injunction, as clarified by the Court's oral ruling.

10. In response to the Court's injunction, CBP took various actions to suspend, modify, or terminate, as appropriate, various contracts and interagency agreements that relied on the FY20 and FY21 barrier system funds to pay for projects and activities prohibited by the Court's injunction, such as installation of barrier system attributes, environmental mitigation projects, and replacement of existing barriers.

11. Additionally, CBP initiated a planning process to identify new border barrier construction projects that could be funded with FY20 and FY21 barrier system funds consistent with the Court's injunction. CBP focused its efforts on identifying areas along the southwest border without current pedestrian barrier, in U.S. Border Patrol's highest priority areas, that would benefit from the construction of new physical barriers. Among other things, CBP conducted site visits and surveys of potential construction sites in California, Arizona, New Mexico, and Texas. Further, CBP considered the improvements to border security and public safety likely to result from new barrier construction, focusing on areas without current pedestrian barrier that have experienced high levels of migration traffic.

12. Based on this planning process, DHS/CBP identified 19 new border barrier construction projects that it is planning to execute with the FY20 and FY21 barrier system funds, totaling approximately 40 linear miles, in California, Arizona, New Mexico, and Texas. A chart with information about each project, including geographic locations and total mileage is attached as Exhibit 1.

13. During the planning process, CBP identified that several of the proposed construction locations sit within challenging natural terrain, such as rocky inclines, steep descents, and creeks

and rivers that flow across the international boundary during rain events. Due to the often dry and arid environment along the southern international boundary with Mexico, summer monsoons and winter storm events can cause extreme surface water flows that cross the international boundary. Rain events occurring hundreds of miles south or north of the international boundary often result in large volume surface waters that cross the international boundary. Based on these conditions, CBP has concluded that construction of a safe and effective barrier in these areas will require construction features that include appropriate water conveyance, drainage and erosion control measures. The purpose of these construction features, which are longstanding components of DHS's border wall design, is to channel or direct water away from the barrier and accompanying patrol road, thereby ensuring the stability of the barrier and enhancing border security by allowing agents to patrol the border, traverse the patrol road, and respond to emergencies during and after storm events. Water conveyance and drainage features also minimize the barrier's impact on storm related surface water flows as well as water flows in creeks and rivers that cross or abut the international border. Without these features, the planned barrier risks causing flooding in the United States and/or in Mexico, potentially impacting private and federal lands in the border region. In barrier construction during 2018 - 2020, CBP funded drainage and erosion features from the appropriations for barrier construction.

14. The new barriers that DHS intends to construct would fill gaps between barriers built during the prior Administration that have their own drainage and erosion features. The goal of the new construction projects is to complete contiguous segments of border barrier with complementary drainage and erosion features across both the new and existing barriers. The completed projects would facilitate unimpeded border security operations and emergency response actions across broad areas of the border during and after storm events.

15. As an example, the Jacumba Gap project in eastern San Diego County illustrates the importance of including drainage and erosion features in the border barrier construction. The Jacumba Gap project would close a 2.1 mile gap between existing barrier fencing where Border Patrol agents report significant migrant traffic. Closing this gap is a priority for CBP.

16. The Jacumba Gap project would be executed in two phases. As part of Phase I, CBP would install approximately 200 feet of mesh barrier on the far eastern end of the project corridor. This is the area where CBP has seen the most migrant traffic crossing around the end of the adjacent existing barrier. Phase I is intended to address, as quickly as possible, the most problematic area. As part of Phase II, CBP would construct 30-foot high steel bollard barrier across the entire 2.1 mile gap. The barrier from Phase I would remain in place, thus creating a double layer of barrier in that area high priority area. A map of the project area is attached as Exhibit 2.

17. The Jacumba Gap project presents some of the greatest topographic, geotechnical, and drainage challenges of any barrier project CBP has ever undertaken. Due to the mountainous terrain throughout the gap, there are numerous existing washes throughout the barrier alignment that will either cross through or flow adjacent to the alignment. Additionally, the composition of the soils and intermittent rainfall cause the washes often go from dry to heavy flows in minutes. Preliminary design plans indicate that one wash along approximately ¼ of the project increases 11 feet in depth during a 25-year storm event. In addition to drainage control challenges throughout the project area, the alignment will require the barrier to traverse substantial elevations and descents across rocky terrain. CBP expects that areas of the planned alignment that encounter large boulders and bedrock could include the use of controlled detonations of explosives. Areas of steep terrain will require cut and fill slopes or terracing to facilitate construction of the barrier and patrol road. However, without drainage and erosion control features included in the Jacumba

design and construction, exposed slopes due to cuts/fills and detonations will be highly susceptible to failure and falling, leaving a gap in the barrier. Couple that with uncontrolled drainage conveyance across the project site, severe damage and outright collapse of the barrier and patrol road is inevitable, especially within the limits of existing washes. A topographical map of the proposed barrier alignment that includes elevation data is attached as Exhibit 3. Photos of the Jacumba Gap project area are below:

This photo shows why the alignment will need to be offset from the border.

18. Other project areas have similarly challenging terrain and location features, including steep slopes, mountainous terrain, washes, and river crossings, that require appropriate drainage and erosion control measures. These areas include the San Diego Sector 4 project, which is located approximately 14-miles east of the Pacific coast, and the El Paso Sector 16-4 project, which is located in New Mexico just west of the New Mexico-Texas state line. In the absence of necessary drainage and erosion control measures in these project areas, CBP could attempt to mitigate some risk by installing a concrete road. This would ensure the road would remain passable during significant water events. A concrete road, however, cannot mitigate all risk. In order to ensure that the foundation of the barrier is not compromised due to the steepness and other challenges of barrier alignments adjacent to the border, CBP must incorporate drainage and erosion control measures to ensure the long-term stability of the barrier and associated patrol roads for their planned 30-year life cycle. Without the drainage and erosion control measures, the life cycle of the barrier is anticipated to be much shorter and more costly to maintain.

19. To ensure the long-term viability of the new barrier and patrol road in the project areas and avoid risks to border security and agent safety, CBP must incorporate effective drainage and erosion control measures into the barrier and road construction. These features mitigate uncontrolled water from storm events and channel water away from the barrier's foundation to protect the integrity of the barriers and ensure safe travel along the border road. They also provide long term protection against foundation and soil erosion that could threaten the stability of the barriers and patrol roads and substantially increase the maintenance costs over time. Proper drainage and erosion control incorporated into the barrier and patrol road allows agents to respond to border threats or emergencies involving other agents, migrants, or the public in a safe and efficient manner.

20. CBP's incorporation of drainage and erosion control features into new construction is consistent with common practice by federal, state and local public agencies, and private entities regardless of the type of construction. Drainage and erosion control measures are included in public agency design and construction codes for vertical construction (*e.g.*, new homes and buildings) and horizontal construction (*e.g.*, roads, utilities, fencing/walls).

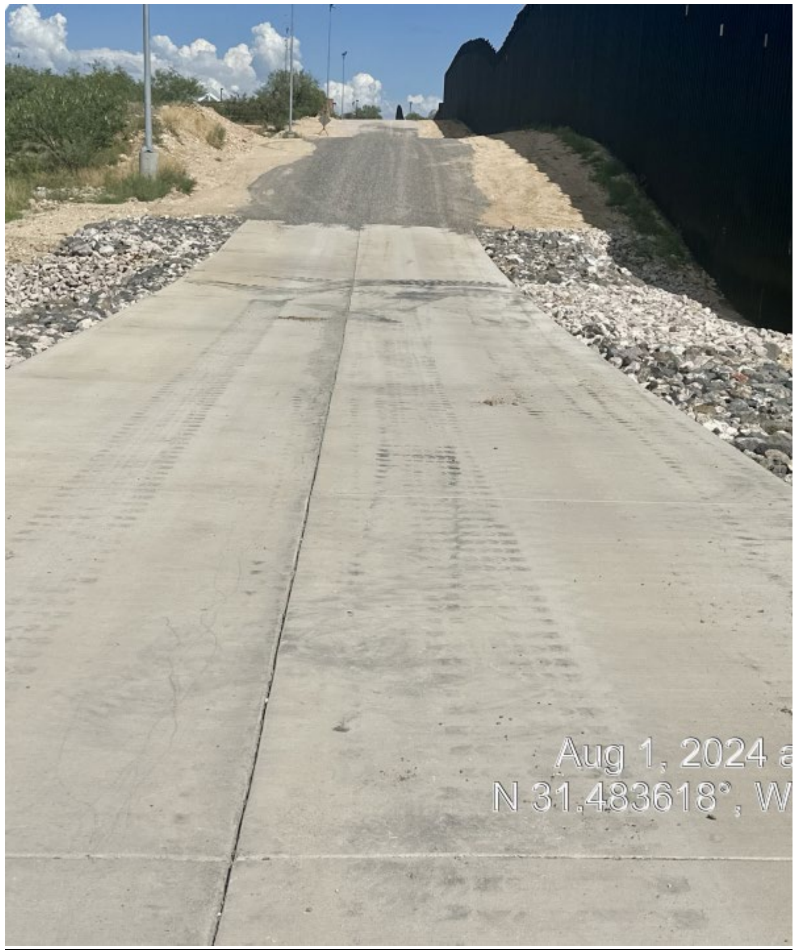
21. CBP has established design requirements for Border Patrol infrastructure, inclusive of border barriers and roads, in CBP's Tactical Infrastructure Design Standards (TIDS). CBP first created the TIDS in 2012 based on experiences and lessons learned from the hundreds of miles of barrier that were constructed beginning in 2008. The TIDS have been updated over the years based on operational updates and additional experience in the field from more recent barrier construction in a wide range of terrain and conditions. The current version of the TIDS (version 5) was most recently updated in August 2020 and remains unchanged since the prior Administration. The TIDS includes specific design and construction requirements for drainage and erosion features, including the installation of, among other things, drainage gates, ditches, culverts, low water crossing, and rip rap. The section of the TIDS addressing drainage protection and erosion control is attached as Exhibit 4. Any contracts awarded for construction of the 19 proposed border barrier projects will require that contractors adhere to the TIDS. As set forth in more detail herein, it is critical that

CBP also require contractors to adhere to the drainage and erosion control requirements set forth in the TIDS where project site conditions warrant such requirements.

22. The specific drainage and erosion control measures that are required for each barrier project are informed by site conditions, terrain, expected weather events, and hydraulic analysis as dictated by the standards set forth in the TIDS. Common drainage and erosion measures range from standard construction practices such as the placement of concrete low water crossings (LWC), rip rap, or culverts, to more complex measures where site conditions and terrain demand it. Examples of these features are described in more detail below:

a. Concrete LWC: In areas where water flows naturally across the international boundary, the need for concrete LWC will be evaluated. The need for concrete LWC is based on existing soil composition, volume of flow, and velocity of the flow. If through engineering analysis, based on requirements set forth in the TIDS, it is determined a concrete LWC is warranted, it typically consists of concrete pavement placed at grade through the limits of the wash. The concrete LWC provides a solid surface to keep the patrol roads passable during and after typical rain event scenarios and with the addition of rip rap or other erosion control materials on the edge of the road, prevent water flowing across the paved road from deteriorating or undermining the barrier. The photo below shows an example of a patrol road at a concrete LWC location.[1]

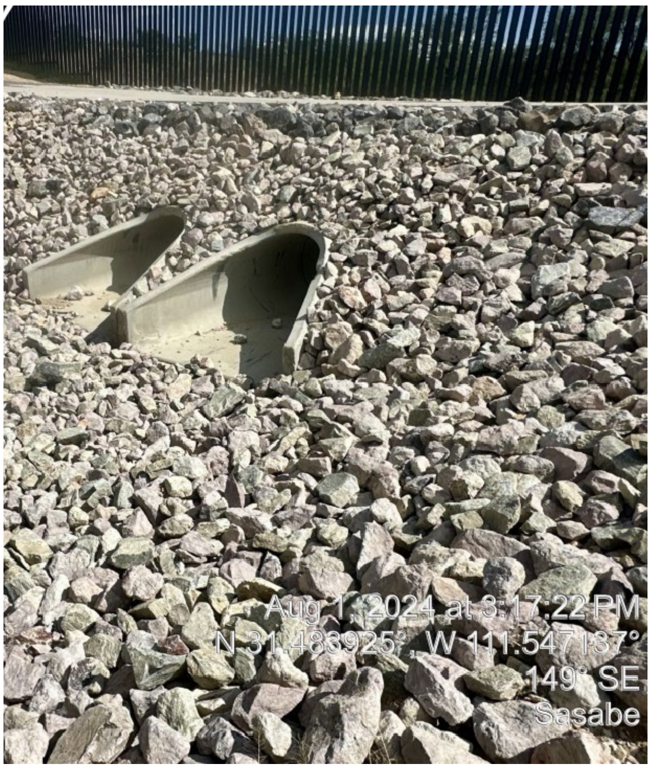
[1] While CBP typically uses concrete as the hardened surface for LWC, the need for paved roads at locations other then LWCs are not based on drainage requirements and is guided by different requirements as informed by the TIDS, such as the geotechnical properties of the underlying soils and the traffic the road is expected to experience.

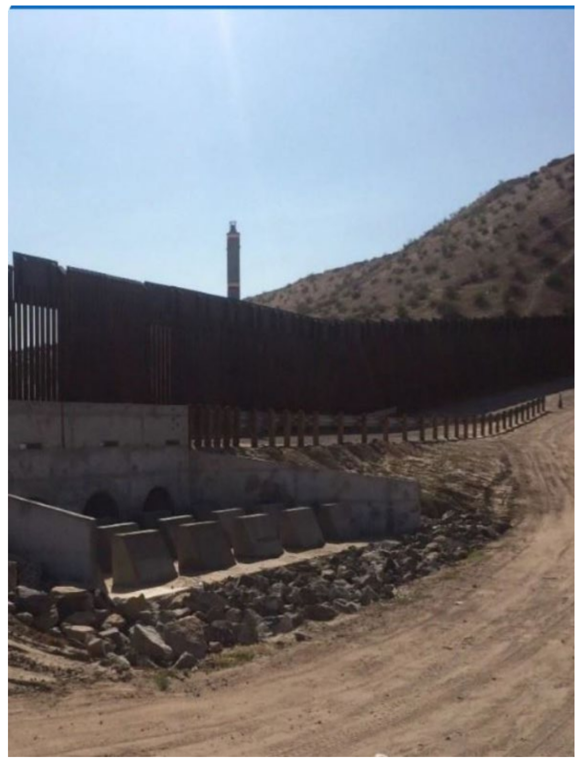


b. Rip Rap: Rip rap is the layered placement of angular rocks to protect soil from erosion due to water flow. Rip rap is common erosion control technique used in border barrier construction to slow the speed of water as it approaches a LWC and protects against scour as water exits the LWC. It protects the barrier and adjacent road by reducing erosion along the foundation of the barrier, thereby increasing the longevity of the infrastructure. The photos below show how rip rap is placed adjacent to the barrier to prevent damage from erosion and water flow as well as long term maintenance.

c. Culverts: A culvert is a tunnel or pipe structure that allows water to flow under a roadway or structure. To protect the border barriers and prevent flooding, culverts are designed to convey water underneath barriers to ensure their long-

term stability. The size and number of culverts on a particular project is based on the size of wash, the amount of water to be conveyed, and the target elevation. The two photos below show examples of simple and complex culverts that allow water to flow under the border barrier without damaging the foundation or bollard fencing and minimize the potential for flooding.





Examples of Riprap and Culverts

d. Roadside Ditches: Roadside ditches are ditches constructed parallel to patrol and access roads for the purposes of collecting storm water surface flow and convey it to the nearest LWC. The roadside ditches are an important tool in the control of drainage throughout project sites and thus protecting the barrier and patrol road.

e. Slope Paving or Matting: Construction of barriers and roads within hilly and/or mountainous terrain require slopes to be cut and/or filled, as described for the Jacumba project area. In addition, soil embankments must be constructed in certain areas to provide a level surface for barrier construction. If the slopes are left unprotected, uncontrolled water from storms will cause ruts to form into the slopes. These ruts can become deep enough to cause failure of the slopes and ultimately lead to failure of the barrier or patrol road as well as compromise agent safety. Slope paving can include a wide variety of materials including concrete paving, riprap or high strength flexible matting anchored to the slopes.

23. Constructing new barriers without appropriate drainage and erosion control measures will significantly increase the risk of failure of the barrier and the potential to cause flooding in the United State and/or Mexico. CBP has seen firsthand how barriers constructed without appropriate drainage and erosion features can undermine border security. Surging water from heavy storm events has caused barriers to collapse. For example, a summer monsoon event in 2014 in the Nogales area of Arizona caused flash flooding in Mexico sending surface water and debris flows north through a normally dry ravine, toward the United States. Due to a lack of appropriate use of drainage and erosion controls at this location, the surface waters and debris flowing south from Mexico first began to collect against the south side of the barrier, eventually forcing water vertically against the foundation to the point of undermining the foundation, thus resulting in the eventual collapse of the barrier.

Barrier collapse west of Nogales, AZ due to lack of drainage control

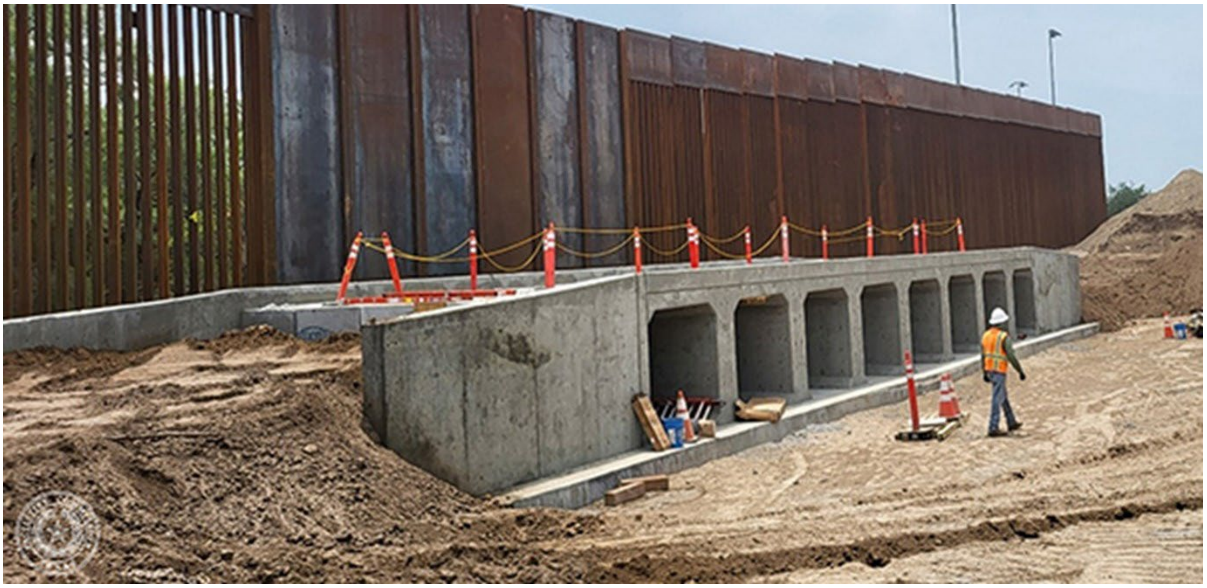
24. Additionally, uncontrolled water due to a lack of proper drainage and erosion control can create a risk of more gradual deterioration and failure over time. The photo below shows how insufficient drainage and erosion measures can lead to degradation of the barrier's foundation and lead to potential safety and border security risks. At this location west of Nogales, Arizona, drainage culverts were not installed beneath the barrier as part of a former CBP project. This area is the bottom of a small valley which collects surface water runoff from the north, east, and west during storm events. Without a culvert to divert the water flow, storm related surface water is channeled through the bollard barrier on top of the barrier foundation instead of underneath the foundation. The surface water flows from the recent monsoon seasons have eroded the slope on the south side of the barrier, exposing the foundation of the barrier. The erosion will increase progressively with each rain event as the surface water creates a waterfall effect further deepening the erosion and transporting soils south into Mexico. The barrier at this location will collapse without the addition of proper drainage conveyance and erosion control measures installed on the slopes.

Barrier foundation at high risk for collapse west of Nogales, AZ due to lack of drainage control on supporting embankment. Barrier offset ~50-ft north from boundary line at this location.

25. The State of Texas includes the same drainage and erosions features as CBP its State-funded border wall projects. Texas has posted photos of its completed drainage and erosion projects on the Texas Facilities Commission website: https://www.tfc.texas.gov/wall/. Several photos on the website are copied below. Texas also includes requirements in its contract solicitations that new border barrier construction projects must comply with the CBP's design requirements in the TIDS, including for drainage and erosion features. *See, e.g.*, RFQ for Design-Build-Services MATOC for the Texas Border Infrastructure Program, Attachment 2, at www.txsmartbuy.gov/esbd/303-3-04702.

17

Texas Border Infrastructure, Rip Rap Bank Stabilization, Maverick County, July 2024



Texas Border Infrastructure, Culvert Structure, Starr County, May 2024

Texas Border Infrastructure, Cement Bank Stabilization and Low Water Crossing, Maverick County, July 2024

26. CBP has reached the point in its planning process where the inability to fund drainage and erosion from the FY21 barrier system appropriation will be a significant impediment to CBP's ability to execute several of the newly approved barrier projects in such a way as to mitigate against the risks noted above associated with the absence of drainage and erosion measures. On September 28, 2024, CBP obligated approximately $242 million through contract task order awards and modifications for construction of 12 of the 19 recently approved barrier projects (Project #1-8, 11-14 on Exhibit 1). Based on information currently available, CBP has assessed that four of these projects require drainage and erosion features based on the terrain and site conditions (Project # 1, 2, 4, 6). Due to the restrictions imposed by the Court's injunction, however, CBP limited the contracts for these four projects to base construction requirements for new border barriers without any drainage or erosion control measures in the scopes of work. The contracts include options that would allow CBP to add drainage and erosion features to the projects at a later date in the event the injunction is modified to allow CBP to spend FY21 barrier system funds for those purposes. Contract options do not obligate funding until they are exercised.

27. CBP has conducted a thorough review of its appropriations and has concluded that the barrier system appropriations are the only source of funds available to pay for the drainage and erosion costs in the planned barrier projects. If these funds cannot be used to pay for drainage and erosion features in new border barrier construction projects, CBP may have to stop work on the newly-approved projects that require drainage and erosion features and avoid future barrier construction in other locations that might require such features.

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This declaration is made pursuant to 28 U.S.C. 1746. I declare under penalty of perjury that the foregoing is true and correct.

Executed on this 21st day of November, 2024

Paul Enriquez
Infrastructure Portfolio Director
Program Management Office Directorate
U.S. Border Patrol

EIGHTH ENRIQUEZ DECLARATION – EXHIBIT 1

CBP Proposed Border Barrier Projects

No.	Project Name	Project Length	Location	Project Information
1	San Diego 15-2 Jacumba Gap Closure	2.1 miles	San Diego County, California, near Jacumba Hot Springs	This project will close a two-mile gap between existing barrier fencing in the Jacumba area of eastern San Diego County where Border Patrol agents report significant migrant traffic.
2	San Diego 4 Gap Closure Project	600 feet & 1500 feet	San Diego County, California, approximately four miles east of the Otay Mesa Port of Entry (POE)	These projects will close three gaps in the barrier constructed by the Department of Defense during the prior Administration. The gaps have become funnel points for crossing migrants. Rescues are common in these areas due to challenging terrain and extreme temperatures. The gap in Smugglers Gluch is adjacent to a viaduct construction project by the Government of Mexico and closure will reduce current and anticipated foot traffic.
3	San Diego Smugglers Gluch Gap Closure Project	350 feet	San Diego County, California, near Imperial Beach approximately three miles west of San Ysidro POE	
4	El Paso Santa Teresa Secondary Barrier Project	7 miles	Dona Ana County, New Mexico, starting at the Santa Teresa POE and continuing east approximately seven miles	This project will construct secondary barrier adjacent to inferior legacy mesh barrier. The project is located in the Border Patrol's Santa Teresa Area of Responsibility, which is the second busiest in the country for migrant flow.

CBP Proposed Border Barrier Projects

No.	Project Name	Project Length	Location	Project Information
5	El Paso 2 Gap Closure Project	950 feet	Luna County, New Mexico, approximately 26 miles west of Columbus, New Mexico	This project will close a gap in the barrier constructed by the Department of Defense during the prior Administration. Gap closure is needed because drive-throughs and pedestrian crossing have increased in this location.
6	El Paso 16-4 Gap Closure Project	1.3 miles	Dona Ana County, New Mexico, approximately ½ mile west of the Texas-New Mexico border	This project will close a gap in the barrier constructed by the Department of Defense during the prior Administration. This area has become a security vulnerability as a crossing point for migrants and narcotics.
7	El Paso Monument Gate	40 feet	Hidalgo County, New Mexico, at the Antelope Wells POE	This project would install a gate that was never completed by the Department of Defense during its barrier construction. The project is located near the Antelope Wells Port of Entry and the absence of a gate has become a security vulnerability.
8	Yuma 10/27 Barry M. Goldwater Range Gap Closure Project	Seven gaps between 40 and 240 feet	Yuma County, Arizona, approximately 20 miles east of San Luis POE	This project will close seven gaps in the barrier constructed by the Department of Defense during the prior Administration near the Barry M. Goldwater Range. Five gaps will be filled with steel bollards and two gaps will be filled with new gates.

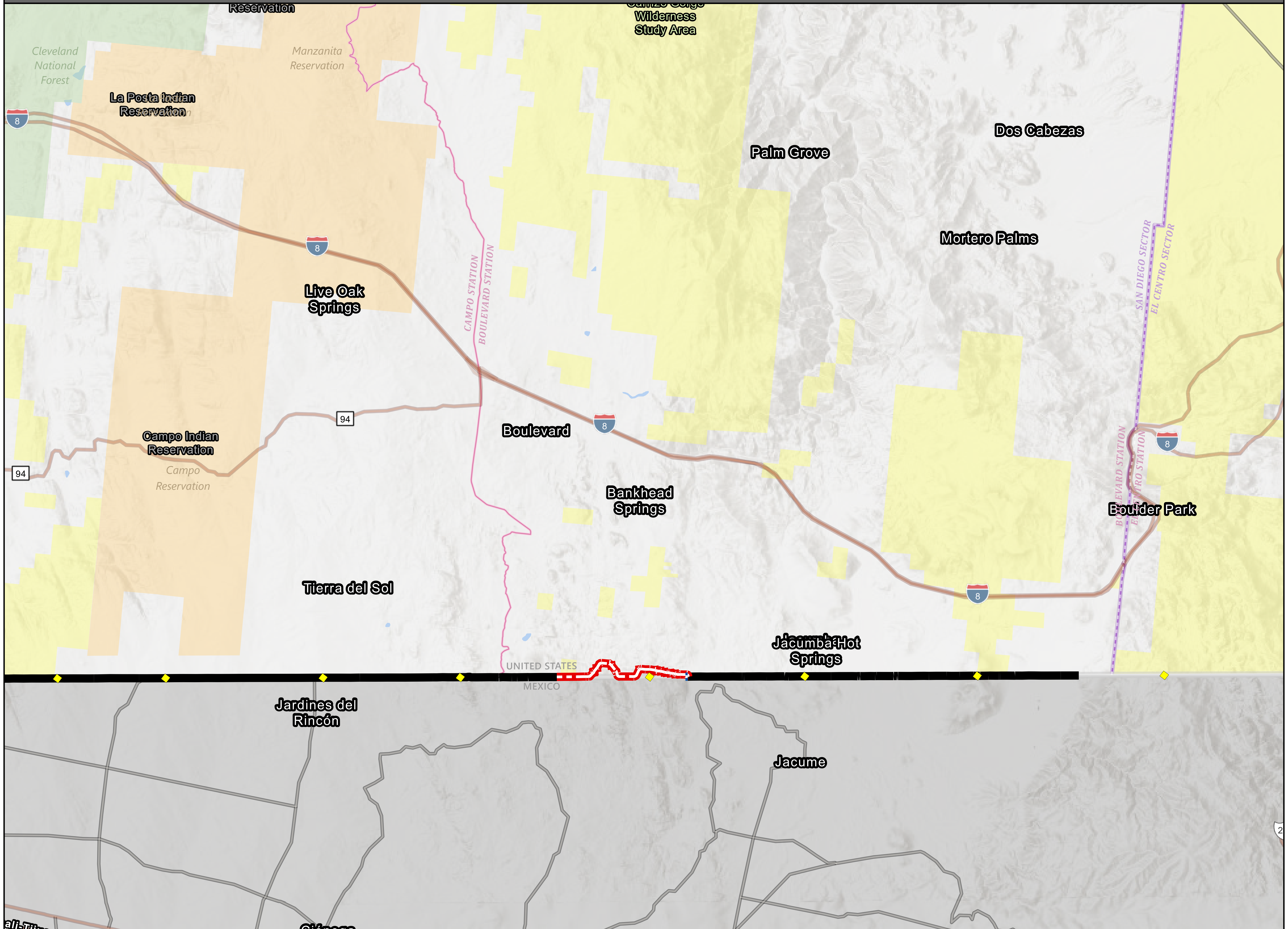
CBP Proposed Border Barrier Projects

No.	Project Name	Project Length	Location	Project Information
9	Tucson 10-4 Gap Closure Project	0.2 miles	Santa Cruz County, Arizona, approximately 10 miles east of Nogales, Arizona	These two projects will close gaps in the barrier constructed by the Department of Defense during the prior Administration. The gaps create security vulnerabilities because of increased migration traffic.
10	Tucson 10-6 Gap Closure Project	2.1 miles	Cochise County, Arizona, approximately 15 miles south of Sierra Vista, Arizona	
11	RGV Gates Project	9 gates between 40 and 150 feet	Hidalgo and Cameron Counties, Texas	Installation of 9 gates to close gaps in existing barrier.
12	RGV-02	3.5 miles	Hidalgo and Cameron Counties, Texas	These projects will close gaps in the existing barrier in the Rio Grande Valley that are funnel points for traffic and pose hazards to migrants and Border Patrol Agents. The RGV-10 project will be divided into eleven segments.
13	RGV-03	1.7 miles		
14	RGV-04	3.8 miles		
15	RGV-10 (Segment C)	4.7 miles		
16	RGV-10 (Segments D &E)	2.8 miles		
17	RGV-10 (Segments F, G, H)	2.3 miles		
18	RGV-10 (Segments I)	3.2 miles		
19	RGV-10 (Segment J, K, L, M)	3.9 miles		

EIGHTH ENRIQUEZ DECLARATION – EXHIBIT 2

San Diego 15-2 Jacumba Gap Closure

Boulevard Station



LEGEND

- Border Monuments
- Existing Pedestrian Barrier
- Jacumba Gap Closure (Phase 1)
- Jacumba Gap Closure (Phase 2)

*If sheet measures less than 11x17" it is a reduced print. Reduce scale accordingly.

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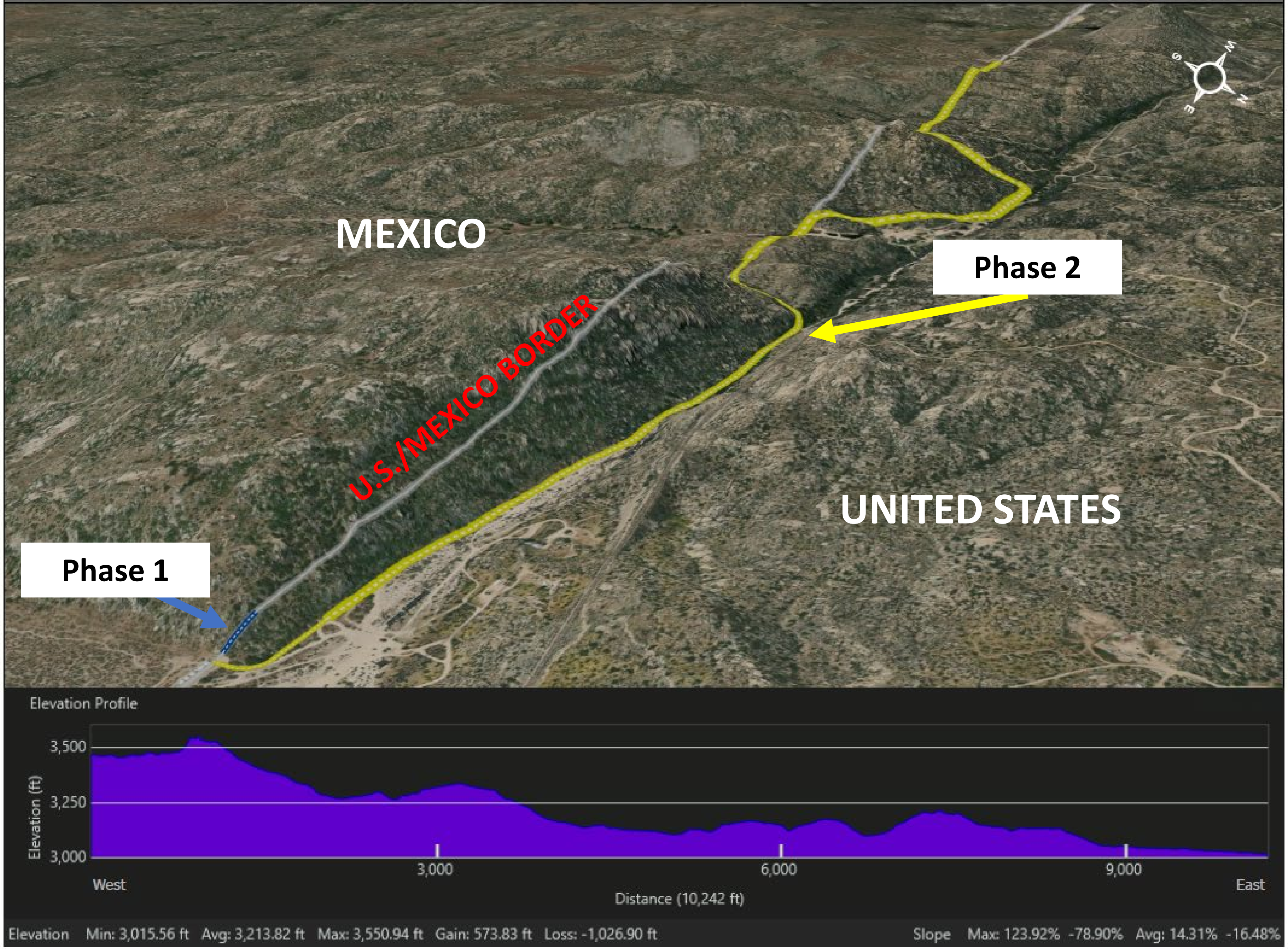
AREA ENLARGED

NORTHWIND

EIGHTH ENRIQUEZ DECLARATION – EXHIBIT 3

SDC Jacumba Gap Closure Project - 3D

View Facing Southwest



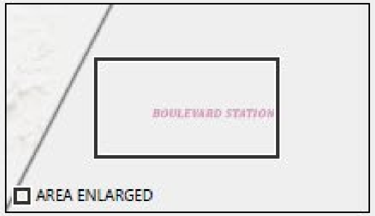
LEGEND

Jacumba Gap Project Alignment

- Phase 1 (~0.05 miles)
- Phase 2 (~2 miles)

"If sheet measures less than 11x17" it is a reduced print. Reduce scale accordingly.

1:4,985 1:4,985



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EIGHTH ENRIQUEZ DECLARATION – EXHIBIT 4

TACTICAL INFRASTRUCTURE DESIGN STANDARDS

Version 5, August 2020

DEPARTMENT OF HOMELAND SECURITY
CUSTOMS AND BORDER PROTECTION
UNITED STATES BORDER PATROL
PROGRAM MANAGEMENT OFFICE DIRECTORATE

Section 1.7 DRAINAGE PROTECTION DESIGN STANDARDS

Any alteration to existing conditions requires consideration of drainage effects as they relate to the installation or improvement of roads, bridges, or signage. Roads, bridges, and signage shall be protected from erosion due to storm water run-off, and they shall allow the conveyance of storm water run-off across the site. Design storms that shall be used for sizing erosion protection and conveyance measures are discussed in **Section 1.7.2**, **General Drainage** and **Section 1.7.3**, **Low Water Crossings**. In addition, any roads constructed or improved within the Roosevelt Reservation, or 60 feet north of the land border, as well as any roads constructed within the Rio Grande and Colorado River floodplains, are required to comply with the border-related treaty between the U.S. and Mexico. Road drainage protection final design and preparation of construction documents shall be the responsibility of the Designer of Record (DOR) based on the minimum criteria and code requirements established herein. For drainage protection of Wall, Gates and Electrical, see subsequent applicable chapters for requirements.

1.7.1 USIBWC FLOODPLAIN

The U.S. Section of the International Boundary and Water Commission (USIBWC) is responsible for ensuring that improvements on the U.S. side of the international border with Mexico comply with treaty provisions as they relate to impacts to the floodplain of the Rio Grande and Colorado River. All new or improved TI constructed within the Colorado River or Rio Grande floodplains are required to comply with such treaty provisions. To be specific, the impact of all new or improved TI within the Rio Grande and Colorado River floodplains shall be evaluated with respect to change in water surface elevation (WSE) and flow deflection across the border. Rise in WSE shall not exceed 6 inches in rural areas and 3 inches in urban areas, and flow deflection relative to pre- and post-construction conditions shall be less than 5 percent in either direction. To verify the impacts are within the above-mentioned limits, hydraulic model(s) shall be developed in accordance with the methodologies and guidelines provided by USIBWC and added to these standards in Appendix G – IBWC River Boundary Design Requirements. See Two-Dimensional Hydraulic Modeling Methodology (Jan, 2020) in this Appendix. The model(s) shall be developed with hydraulic modeling software such as HEC-RAS, for 1-dimentional (1-D) and 2-dimentional (2-D) modeling. Other software may be used depending on its applicability to a specific project and with approval by USIBWC. USIBWC determines design and calibration flow rates along the rivers and the USIBWC may provide available model(s) and data on the rivers. The model shall match existing conditions criteria as provided by USIBWC and shall model proposed conditions. The results from the existing and proposed conditions shall be compared using the difference of WSE and flow deflection calculations using USIBWC guidance. Modeling results in 1-D and 2-D use different sets of input and output datasets and the modeler shall coordinate with USIBWC as to the use and application of such data. The proposed condition models shall demonstrate that the impacts of proposed structures to be built within the floodplain will not exceed the rise in WSE and flow deflection limits stated above. As part of the design process, the designer shall seek USIBWC input relative to the specific hydraulic model software to be used and key model related assumptions.

For drainage areas outside the Rio Grande and Colorado River regulated floodplains and local drainage areas within the Rio Grande and Colorado River regulated floodplains, refer to **Section 1.7.2**, **General Drainage**.

1.7.2 GENERAL DRAINAGE

The methodology for determining hydrologic flows outside the Rio Grande and Colorado River floodplains, and for local drainage crossings within the Rio Grande and Colorado River floodplains, shall be based on local county or state drainage manuals or design standards and the requirements discussed in the Technical Drainage Report Requirements for USIBCW Review, provided with these TI Standards in Appendix H – IBWC Land Boundary Design Requirements. The modeler shall use best available data such as FEMA regulatory flows, published documents, stream gage station data, etc. In the cases where the published data is older than 10-years or hydrologic data is not available, a new hydrologic analysis must be completed.

At a minimum, the following design standards shall be used:

- For watersheds less than 160 acres (0.25 square mile), the rational method can be used.
- For watersheds between 160 acres (0.25 square mile) and 25 square miles, the **Natural Resources Conservation Service** methodology outlined and included WinTR-55 software can be used (U.S. Department of Agriculture [USDA], n.d.).
- For watersheds larger than 25 square miles, the regression equations for the area shall be used. These equations are provided by the **USGS National Streamflow Statistics Program** (n.d.). Gauges or flow rate measurements can also be used if data is available and provided by USGS. The **USGS StreamStats** (n.d.) discharge and watershed delineation parameters can be used for preliminary analysis but shall not be used for design.
- In cases where watersheds are distributary in nature, 2-D integrated hydrology and hydraulics model shall be used.

The hydrologic analysis can alternatively be developed using available software such as HEC-HMS, WinTR-55, FLO-2D and others. The methodology for developing the 25-year, 50-year and 100-year events shall follow local, state and other widely accepted methodology, as applicable. Spatial land use and soil data can be acquired online from government entities such as cities, counties, state and/or federal agencies. These government entities provide polygons and shape files delineating urban areas, which shall be used for this analysis. As the floodplain analysis described in **Section 1.7.1**, **USIBWC Floodplain,** drainage crossings shall be modeled with software such as HEC-RAS to show that impacts due to new construction do not cause water surface elevations to rise more than stated in **Section 1.7.3**, **Low Water Crossings**. USIBWC may provide drainage support data along the land border when available. Use available data to compile new model when possible. In some locations where data is not available given the lack of accessibility, particularly in Mexico, assumptions on the data shall be annotated and approved by USIBWC.

All-weather roads, roadside ditches, and riprap requirements shall be designed as a minimum for the 25-year storm event. Where the offsite flow at the roadside conveys by means of culverts only, the culvert must be designed for the 50-year storm in the rural area and 100-year in the urban area to prevent roadway overtopping. Where the combination of culverts and concrete LWC is used to convey the storm flow at the roadside, the culverts don't need to be designed for the 50-year storm, as long as the combination of the culverts and LWC contain the 50-year flow in the rural area and a 100 year in the urban area in the LWC, in addition, the flow depth over the LWC must not exceed one foot for the 25-year storm when the combination design approach is considered. Other drainage infrastructure not covered by this manual should refer to the **UFC 3-201-01** (2018) standards and seek approval by CBP. Low

Impact Development (LID) guidelines can also be found on the **UFC 3-210-10** (2015) when LID is considered.

Similar to overseeing compliance of construction within the Rio Grande and Colorado River floodplains, USIBWC is also responsible for ensuring that improvements on the U.S. side of the international land border with Mexico comply with treaty provisions as they relate to cross-border drainage. Impact to WSE between the pre and post construction conditions due to any new TI, including patrol and access roads, being built along the land border between the U.S. and Mexico within the Roosevelt Reservation shall not exceed 6 inches in rural areas and 3 inches in urban areas using the 100-year storm event as required by USIBWC. TI new construction or improvements outside the Roosevelt Reservation, or 60 feet north of the border, do not need to comply with the drainage treaty provisions mentioned above, but shall comply with FEMA, local and state requirements and these TI Design Standards.

1.7.3 LOW WATER CROSSINGS

Low water crossings are road-stream crossing structures designed to be overtopped by high flows (Clarkin, Keller, Warhol, & Hixson, 2006). In addition to conveying offsite runoff across roads, the LWC shall be designed to drain roadside ditches and to cross low lying or depressed areas that are prone to ponding. There are three general types of LWC: unvented ford, vented ford and low water bridges. Unvented ford crossings provide stream crossing without the use of culverts and are dry most of the year. Vented fords use culverts under the crossing and allow low flows to pass without regularly flooding over the crossing. All LWC shall have positive drainage away from the road. In ephemeral and intermittent watercourses, LWC shall have no more than 6 inches of standing water after any storm event anywhere in the crossing. At a minimum, the extents of LWC shall be determined based on the 50-year storm event WSE for rural areas and the 100-year storm event WSE for urban areas. LWC geometry should be designed to allow a depth of no more than 1 foot of water on the road during the 25-year storm event anywhere in the crossing. An example of this design is shown in **Figure 27 – Unvented Ford Low Water Crossing and Design Criteria**. Design analysis shall be completed to determine if safe vehicle passage can be accomplished through 1 foot of water with the anticipated flow velocities. If it cannot be shown that the weight of a patrol vehicle can withstand the force of the drainage flow, then appropriate signage shall be placed warning drivers to not enter when flooded. Any variances to this criterion shall be determined during the pre-solicitation site visit on a project-by-project basis.

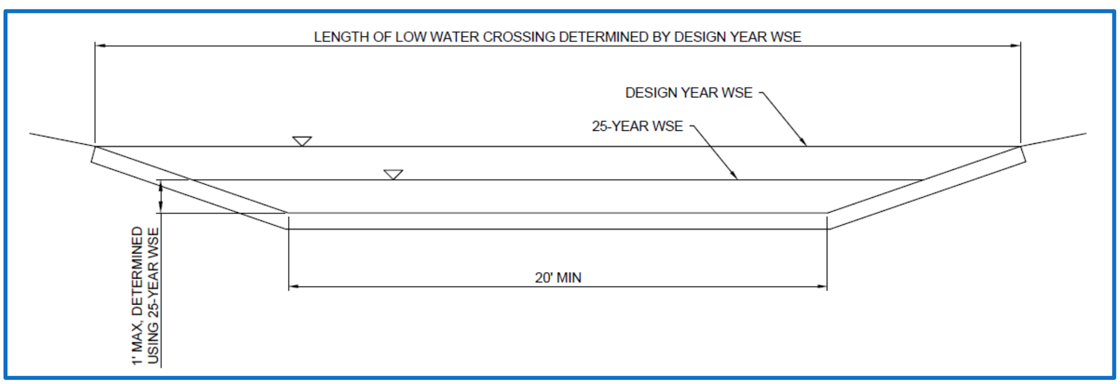

Figure 27 – Unvented Ford Low Water Crossing and Design Criteria

A minimum invert length of [redacted] shall be provided to allow vehicular passage. The maximum longitudinal grade-break between the invert and side slopes of a LWC shall be 5± percent. This avoids

scraping of vehicle bumpers as a vehicle traverses the LWC. LWC shall be designed using either reinforced concrete or articulated concrete mat. Concrete slabs shall have a minimum slab thickness of 6 inches. Unvented ford crossings shall be the first means of conveying water across patrol roads. Where roadway geometry or the 25-year water depth criteria cannot be met, culverts or bridges shall be introduced. All LWC shall have reinforced concrete turn-down walls, or some other means of permanent scour protection, and shall be provided around the entire perimeter to depths required to protect against scour. For standard concrete low water crossing details, see **Appendix D**, **Miscellaneous Standard Details.**

1.7.4 CULVERTS

Culverts crossing roadways shall typically be constructed of reinforced concrete pipe (RCP) or reinforced concrete box culverts; all other culverts may be constructed of either corrugated metal pipe (CMP) or high density polyethylene pipe (HDPEP) as approved by CBP. The use of culverts shall meet rises in water surface elevation requirements described herein. Where large volumes of water cause rise in water surface elevation above requirements, the use of bridges shall be evaluated. Each CBP sector requires specific culvert standards and sizes. See **Table 4 – Culvert Standards by CBP Sector**, for the source standards for each sector. For complementary information refer to **UFC 3-201-01** (2018). Provide a minimum of 6 feet of clearance between the US side of the wall and culvert outlets/inlets. See **Chapter 3, Section 3.4.1 Drainage Swing Gate Design Criteria** for clearance requirements.

CBP Sector	Agency Culvert Standards
San Diego/ El Centro	Caltrans
Yuma/ Tucson	ADOT
El Paso	TxDOT and NMDOT
Big Bend/Del Rio/Laredo/RGV	TxDOT

Table 4 - Culvert Standards by CBP Sector

1.7.4.1 CULVERT GRATES

When culverts cross through the wall, and for pipes that are [redacted], secured grates and/or trash racks are required. For land border wall, grates shall be placed on the U.S. side of the wall. For river border wall, grates shall be placed on the Mexico side of the wall. For culverts under patrol roads within river border enforcement zones, grates shall be placed on both the U.S. and Mexico sides of the culvert. Grates serve multiple purposes including security and maintenance. For security and safety reasons, the grates should be locked while in either closed or open positions. Grates will protect the culverts from blockage and damage from debris. Grates will require frequent inspection and maintenance for removal of debris that blocks flows and causes ponding at the upstream end of the culvert. For designed box culverts and culverts [redacted], the grate system must be designed such that there is no clear opening greater [redacted]. The type of secured grate shall be similar to that shown in **Appendix D, Miscellaneous Standard Details**.

1.7.4.2 CULVERT CONSTRUCTION

The backfill adjacent to and above the culvert may be placed in conjunction with normal embankment construction. The bedding beneath the culvert should include pea gravel or a permeable material. Bedding shall be placed on compacted subgrade.

Erosion protection should be placed at both ends of every culvert. This may include either concrete headwalls, sheet piles, gabion basket headwalls or grouted riprap. Gabion baskets shall be used upon approval of CBP.

In some instances, vehicle-rated grates may be placed on the top of culverts to provide visibility inside to CBP agents. The implementation of vehicle grates, and the need for culvert end grates, shall be determined during pre-solicitation site visits on a project-by-project basis.

1.7.5 ROADSIDE DRAINAGE

The design of roadside drainage has a myriad of configurations as through the CBP jurisdictional road alignments. Drainage design guidance for many road configurations can be found in **UFC 3-250-01** (2016a) and **UFC 3-250-09FA** (2004b).

A roadside ditch is required to provide proper drainage control parallel to patrol, maintenance or access roads, unless otherwise approved by CBP during the design phase. The size and capacity of the ditch will vary depending on the volume of water needing conveyance. If the full-flow capacity of the ditch yields a velocity greater than 3 feet per second, the ditch shall be lined with erosion protection as described in **Section 1.7.6, Erosion Control**. Roadside ditches shall be designed with a minimum of 3 inches of freeboard using the design storm, unless otherwise dictated by local design code.

Prior to the design of the roadside ditch, access across the ditch shall be determined and confirmed with CBP to ensure that the presence of the ditch does not hinder Border Patrol's operational requirements. Where continuous or point specific vehicular access is required, the roadside ditch shall be of trapezoidal shape with a [redacted] minimum bottom width and a maximum side slope of 3.5:1 (horizontal to vertical) for concrete-lined, and 6:1 (horizontal to vertical) for earthen slopes. Where additional space within the roadway easement permits, shallower side slopes in particular for concrete lined ditches, shall be evaluated. Where access from the patrol, maintenance or access road is not required across the roadside ditch, the ditch shall be designed solely based on drainage and geotechnical recommendations. Roadside ditches shall not be permitted to freely discharge into land outside CBP easement limits. LWC shall be discharged into LWC or retention basins construction within CBP easement.

1.7.6 EROSION CONTROL

For any LWC or culvert(s) installations, long-term erosion control is required at both upstream and downstream locations throughout the entire enforcement zone. Use **FHWA-NHI-06-086, Hydraulic Design of Energy Dissipaters for Culverts and Channels** (2006) or other Federal and Local guidance to develop erosion protection measurements. When riprap is used for erosion control, the minimum gradation size for riprap is D50 of 6 inches, and the maximum size of riprap depends on the result of drainage analysis. All riprap with a D50 of less than 18 inches shall be grouted, unless approved by CBP. For general riprap details, see **Appendix D, Miscellaneous Standard Details**. Where the use of grouted riprap is not required, from either drainage or operational perspective, the use of bio-retention ponds or swales shall be considered. Other forms of erosion control, such as erosion control mats, concrete slope protection, and soil cement, shall be permitted as final design dictates and subject to CBP approval. Sheet piles or other structural solutions may be needed to protect the wall from scour during the design year flood. The wall shall be designed to withstand the USIBWC design flood. All other infrastructure shall be local drainage scour protection.

Newly constructed roadway foreslopes and backslopes, when not on rock, shall require the application of native seed mix as a minimum measure to resist long term erosion. Such slopes shall also be evaluated based on geotechnical recommendations for additional soil erosion prevention measures such as, but not limited to, concrete slope protection, geotextile, check dams, high performance turf reinforcing mat (see **Figure 28 – Erosion Control Using High Performance Turf Reinforcing Mat**), etc.

Figure 28 - Erosion Control Using High Performance Turf Reinforcing Mat

Detailing and specification of temporary measures against erosion control and sediment transport to be used during construction shall comply with local state requirements for storm water pollution prevention (SWPP).

Design of all permanent and temporary erosion control measures shall utilize site-specific geotechnical recommendations in conjunction with the design codes and criteria referenced herein.